Public Works Canada
Solar Programs Office

PUSH COST ACCOUNTING HANDBOOK

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* Note: The Cost Sheets are also available separately from PUSH Coordinators or SPO.

PUSH COST ACCOUNTING SYSTEM: INTRODUCTION

A cost accounting system has been developed for use in all PUSH projects. This system will establish a common format for the presentation of major cost components of a solar project and allow analysis of these components within the overall context of the PUSH program.

The system is based on a classification of costs into a number of categories within two major divisions: Construction Costs and Engineering and Professional Fees. This classification is designed for ease of completion by both designers and contractors. It recognizes the design components of solar installations and standard procurement practices within the construction industry.

Cost information is required at three major stages:

1) Preliminary Design
2) Final Design
3) Construction

The same classification framework is used at each stage. This will permit the reporting of costs at increasing levels of accuracy as more information becomes available.

Use of the cost accounting system will result in a number of important benefits:

1) Information feedback to solar system designers
2) Benefit-cost analysis of solar systems
3) Project proposal evaluation (comparative value ranking)
4) Project expenditure records for auditing/accounting purposes

All participants in the PUSH program are requested to use the cost accounting system in order to reduce time spent in the preparation, review, evaluation and processing of project documents and to provide an accurate and consistent record of project expenditures.

PROCEDURE

At the feasibility stage of the project, overall cost estimates are required for the two major divisions:

1) Construction costs
2) Engineering and Professional Fees

These two estimates should be submitted when the initial funding application is made.

Thereafter, cost estimates should be submitted on copies of the documentation supplied on the following pages. At each stage, a copy of the completed document will be forwarded to SPO by the PUSH coordinator.

Push Project Document	Procedure
Cost Estimation Sheet	To be completed by the designer 1) At the Preliminary Design Stage 2) At the Final Design Stage. At each stage, a copy of the report is submitted with other design documents.
Progress Claim Sheet	One copy to be completed by the main contractor within 10 days of award of contract. Further copies to be submitted with each monthly invoice.
Final Cost Sheet	To be completed by the Project Manager after the project is commissioned.
Cost Estimation Worksheet	For use as a working copy to compile costs at each of the above stages. For most cases, SPO will not require a copy of the worksheet; it is intended for use as a convenient guideline only.

One copy to be completed by designer for preliminary and final design

PUSH PROJECT COST ESTIMATION SHEET	Project Identification No: _____
Project Title: _____ Project Phase: _____ Date of Estimate: _____ Gross collector area (m^2) ___ Heat storage volume (m^3) ___	Implementing Dept/Agency: _____ _____ Prepared by: _____

A) CONSTRUCTION COSTS	Estimate $	SPO Use Only %
01 COLLECTOR ARRAY (No. of collectors: _____) (includes $_____ ex-factory cost per collector)	.. ..	.. ..
02 COLLECTOR SUPPORT STRUCTURE	.. ..	.. ..
03 PIPING	.. ..	.. ..
04 DUCTWORK	.. ..	.. ..
05 INSULATION	.. ..	.. ..
06 EQUIPMENT	.. ..	.. ..
07 AUXILIARY HEATING	.. ..	.. ..
08 HEAT STORAGE	.. ..	.. ..
09 CONTROLS	.. ..	.. ..
10 ELECTRICAL	.. ..	.. ..
11 BUILDING MODIFICATIONS	.. ..	.. ..
12 COMMISSIONING AND TESTING*	.. ..	.. ..
13 GENERAL CONDITIONS OVERHEAD AND PROFIT/FEE	.. ..	.. ..
CONSTRUCTION TOTAL:		

B) ENGINEERING AND PROFESSIONAL FEES	
01 PRELIMINARY DESIGN	.. ..
02 FINAL DESIGN	.. ..
03 INSPECTION	.. ..
04 COMMISSIONING AND TESTING*	.. ..
ENGINEERING AND PROFESSIONAL FEES TOTAL:	

A + B TOTAL:	

* Commissioning and Testing costs should be included in only one of A) or B).

One copy to be completed by contractor and submitted with invoice every 30 days

PUSH PROJECT CLAIM SHEET	Project Identification No: _____
Project Title: _____ Estimated Completion Date: _____ Date of Claim: _____	Contractor: _____ Prepared by: _____

A) CONSTRUCTION COSTS	(1) Contract Estimate ($)	(2) Progress Claim for Period _____ to _____ ($)	(3) Total Claimed to Date (includes 2) ($)
01 COLLECTOR ARRAY (No. of collectors: _____) (includes $_____ ex-factory cost per panel)	.. .. ..	.. ..	.. ..
02 COLLECTOR SUPPORT STRUCTURE	.. .. ..	.. ..	.. ..
03 PIPING	.. .. ..	.. ..	.. ..
04 DUCTWORK	.. .. ..	.. ..	.. ..
05 INSULATION	.. .. ..	.. ..	.. ..
06 EQUIPMENT	.. .. ..	.. ..	.. ..
07 AUXILIARY HEATING.	.. .. ..	.. ..	.. ..
08 HEAT STORAGE	.. .. ..	.. ..	.. ..
09 CONTROLS	.. .. ..	.. ..	.. ..
10 ELECTRICAL	.. .. ..	.. ..	.. ..
11 BUILDING MODIFICATIONS	.. .. ..	.. ..	.. ..
12 COMMISSIONING AND TESTING*	.. .. ..	.. ..	.. ..
13 GENERAL CONDITIONS OVERHEAD AND PROFIT/FEE ..	.. .. ..	.. ..	.. ..
TOTAL			

* Depending on the scope of work, this item may not be included in Construction Costs.

INSTRUCTIONS TO CONTRACTOR

Complete a cost accounting form for each 30-day Progress Claim submitted for work on a PUSH-funded solar project. Forward the completed form to the Project Manager with an invoice for processing and payment.

(1) Column 1 must be completed by the Contractor within 10 days of award of the contract. Column 1 estimates must be provided on each cost accounting form thereafter.
(2) Column 2 should contain costs for the last 30-day period for each item. The Column 2 total will be the amount shown on the invoice.
(3) Column 3 required total claims to date against each item, including the current claim (i.e. the amount in Column 2).

One copy to be completed by project manager on completion of project

PUSH PROJECT FINAL COST SHEET	Project Identification No:_____
Project Title: _____ Date Construction Complete: _____ Area of Collectors (m^2)_____ Volume of Storage (m^3)_____	Dept/Agency: _____ _____ Prepared by: _____

A) CONSTRUCTION	Final Cost $	Instructions To Dept/Agency
01 COLLECTOR ARRAY (No. of collectors: _____) (includes $_____ ex-factory cost per panel)	.. .. ..	Complete the Final Cost Sheet after the final Claim Sheet is submitted by the contractor and the final invoice is submitted by the designer. The Construction Cost on this sheet should be the same as the total in Column (3) of the last Claim Sheet from the contractor.
02 COLLECTOR SUPPORT STRUCTURE	.. .. ..	
03 PIPING	.. .. ..	
04 DUCTWORK	.. .. ..	
05 INSULATION	.. .. ..	
06 EQUIPMENT	.. .. ..	
07 AUXILIARY HEATING	.. .. ..	
08 HEAT STORAGE	.. .. ..	
09 CONTROLS	.. .. ..	
10 ELECTRICAL	.. .. ..	
11 BUILDING MODIFICATIONS	.. .. ..	
12 COMMISSIONING AND TESTING*	.. .. ..	
13 GENERAL CONDITIONS OVERHEAD AND PROFIT/FEE	.. .. ..	
CONSTRUCTION TOTAL:		

B) ENGINEERING AND PROFESSIONAL FEES	
01 PRELIMINARY DESIGN	.. .. ..
02 FINAL DESIGN	.. .. ..
03 INSPECTION	.. .. ..
04 COMMISSIONING AND TESTING*	.. .. ..
ENGINEERING AND PROFESSIONAL FEES TOTAL:	

A + B TOTAL:	

* Commissioning and Testing costs should be included in <u>one</u> of A) <u>or</u> B).

PUSH COST WORKSHEETS: INTRODUCTION

The worksheets on the following pages are provided as both a guideline and a working copy for use when estimating or calculating solar system costs at any stage during a PUSH project.

Items are grouped and numbered according to the classification used on the cost sheets. Each main item that appears on the cost sheets is broken down into component parts on the worksheets, and a description is provided for each of these components. Cost estimates can be entered against each component in the column on the left hand margin of the worksheet, then transferred to the appropriate cost sheet.

The user can complete the worksheets at any or all of the project stages for which a cost statement is required. Although only subtotals are required for cost reporting purposes, it is suggested that the user should at least refer to the worksheets to ensure that costs have been entered in the correct category and that costs are totalled in a consistent manner from one stage of the project to the next.

WORKSHEET: CONSTRUCTION (COSTS/)

Amount $	Item	Included
	01 COLLECTOR ARRAY	
.....	011 Panels	Ex-factory cost of solar panels
.....	012 Special brackets and fittings	Ex-factory cost of special brackets and fittings to mount/clip panels together
.....	013 Freight costs	Cost of freight, factory to site
.....	014 Labour	Labour costs, handling/mounting panels
.....	01 SUBTOTAL, COLLECTOR ARRAY	
	02 COLLECTOR SUPPORT STRUCTURE	
.....	021 Support structure	Cost of manufacture of support structure for mounting panels
.....	022 Additional roof finish costs	Cost of flashing around support structure
.....	023 Labour	Labour costs, installing support structure
.....	02 SUBTOTAL, COLLECTOR SUPPORT STRUCTURE	
	03 PIPING	
.....	031 Collector header pipework	Material costs for pipe, fittings brackets, valves, etc. to connect panels
.....	032 Primary circuit pipework	Material costs for pipe, fittings, brackets, valves, etc. from panels to storage
.....	033 Secondary circuit pipework	Material costs for pipe, fittings, brackets, valves, etc. from storage to distribution
.....	034 Instrumentation & controls	Material costs, heat and pressure gauges, etc.
.....	035 Labour	Labour costs, installation and pressure testing of above
.....	03 SUBTOTAL, PIPING	
	04 DUCTWORK	
.....	041 Collector header ductwork	Material costs for ducting, fittings, brackets, dampers, etc. between solar panels
.....	042 Primary circuit ductwork	Material costs for ducting, fittings, brackets, dampers, etc. from panels to storage
.....	043 Secondary circuit ductwork	Material costs for ductings, fittings, brackets, dampers, etc. from storage to distribution
.....	044 Instrumentation and controls	Material costs for thermometers, manometers, etc.
.....	045 Labour	Labour costs for installation and testing of above
.....	04 SUBTOTAL, DUCTWORK	

WORKSHEET: CONSTRUCTION COSTS/2

Amount $	Item	Included
	05 INSULATION	
.....	051 Collector header piping/-ductwork	Material costs, insulation piping/ductwork, between panels
.....	052 Primary circuit piping/-ductwork	Material costs, insulation piping/ductwork, panels to storage
.....	053 Secondary circuit piping/-ductwork	Material costs, insulation piping/ductwork, storage to distribution
.....	054 Other pipework/ductwork	Material costs, insulation of piping/ductwork not included above.
.....	055 Storage	Material costs, insulation of storage tank (if not included in 081 below)
.....	056 Labour	Labour costs, above insulation work
.....	05 SUBTOTAL, DUCTWORK	
	06 EQUIPMENT	
.....	061 Pumps	Material costs, including site delivery, pumps for solar system
.....	062 Fans/air handling units	Material costs, including site delivery, fans/air handling units for solar system
.....	063 Heat exchangers	Material costs, including site delivery, heat exchanges for solar system
.....	064 Heat transfer fluid	Cost of heat transfer fluid used in liquid solar system
.....	065 Other special equipment	Material costs, items for solar system not classified above
.....	066 Labour	Labour costs to install above items
.....	06 SUBTOTAL, EQUIPMENT	
	07 AUXILIARY HEATING*	
.....	071 Boiler/furnace	Material costs, including site delivery, for boiler/furnace which forms part of solar system
.....	072 Water heater	Material costs, including site delivery, for electric/gas water heater which forms part of solar system
.....	073 Heat pump	Material costs, including site delivery, for heat pump (part of solar system)
.....	074 Baseboard	Material costs, including site delivery, for baseboard (part of solar system)
.....	075 Other	Items for auxiliary heating not classified above but forming part of solar system
.....	076 Labour	Labour costs to install above items
.....	07 SUBTOTAL, AUXILIARY HEATING	

Note to designers: Generally, this is to cover additional costs of auxiliary heating over a "conventional" system. These items are necessary to boost or supplement the temperatures of the solar system, and would generally be included in a "conventional" heating system. The cost of these items must be justifiable if claimed as part of solar system.
Note to contractors: Only items approved within this category at the design stage can be claimed.

WORKSHEET: CONSTRUCTION COSTS/3

Amount $	Item	Included
	08 STORAGE	
.....	081 Tank/bin	All material costs associated with concrete or metal storage tank, including support, cover, etc.
.....	082 Storage medium	Cost of rock, phase charge material, etc. used for storing heat collected from panels, including site delivery costs
.....	083 Labour	All labour costs associated with installation of storage items
.....	08 SUBTOTAL, STORAGE	
	09 CONTROLS	
.....	091 Controls	Material costs for all control systems required for proper functioning of solar system
.....	092 Labour	Labour costs to install controls
.....	09 SUBTOTAL, CONTROLS	
.....	**10 ELECTRICAL**	Material and labour costs for all electrical work associated with the solar system
	11 BUILDING MODIFICATIONS	
.....	111 Structural changes	Material and labour costs to upgrade/-strengthen walls/roof to accommodate solar panels and support structures
.....	112 Vertical access	Material and labour costs to install or extend staircase/stepladder for access
.....	113 Roof traffic	Material and labour costs to install safe walkways for review/inspection of collectors
.....	114 Mechanical room changes	Material and labour costs to provide additional mechanical room space to accommodate equipment associated with solar system, e.g. pumps
.....	115 Additional piping/-ductwork enclosures	Material and labour costs for furring in pipes and ducts associated with solar system
.....	116 Additional insulation*	Material and labour costs to provide additional insulation (not specified in 05) necessary to maximize solar system efficiency
.....	117 Other	Other building modifications required to accommodate the solar system not classified above
.....	11 SUBTOTAL, BUILDING MODIFICATIONS	

Note to designers: Items included in this section must be justifiable as necessary for the efficient working of the solar system.

WORKSHEET: CONSTRUCTION COSTS/4

Amount $	Item	Included
	12 COMMISSIONING AND TESTING	
.....	121 Startup	Costs, including labour, for testing and balancing of complete system
.....	122 Monitoring	If monitoring is part of contract, include rental costs of monitoring equipment and labour costs
.....	12 SUBTOTAL, COMMISSIONING AND TESTING	
	13 GENERAL CONDITIONS, OVERHEAD AND PROFIT/FEES	
.....	131 General conditions	Site access, site accommodations, site protection, temporary utilities, equipment rental costs (hoists, cranes), site supervision, permits, insurance, winter conditions, clean up, etc.
.....	132 Overhead and profit/fees	Head office overhead and profit/fees, including project management fee if part of contract
.....	13 SUBTOTAL, GENERAL CONDITIONS, OVERHEAD AND PROFIT/FEES	

WORKSHEET: ENGINEERING AND PROFESSIONAL FEES/1

Amount $	Item	Included
	01 PRELIMINARY DESIGN	
.....	011 Architect/engineer consultants' fees	All architects/engineers/consultants' fees associated with the preliminary design of the solar system
.....	012 Travel costs	All travel costs, e.g. site visits, incurred during preliminary design
.....	01 SUBTOTAL, PRELIMINARY DESIGN	
	02 FINAL DESIGN	
.....	021 Architect/engineer consultants' fees	All architects/engineers/consultants' fees associated with final design and preparation of construction documents
.....	022 Travel costs	All travel costs incurred during final design stage
.....	02 SUBTOTAL, FINAL DESIGN	
	03 INSPECTION	
.....	031 Architect/engineer consultants' fees	All architects/engineers/consultants' fees associated with inspection of project during construction stage
.....	032 Travel costs	All travel costs incurred in 031
.....	03 SUBTOTAL, INSPECTION	
	04 COMMISSIONING AND TESTING*	
.....	041 Architect/engineer consultants' fees	All architects/engineers/consultants' fees associated with testing, balancing and monitoring of system
.....	042 Travel costs	All travel costs incurred
.....	043 Rental/purchase monitoring equipment	Rental/purchase cost of equipment required to monitor operation of system
.....	04 SUBTOTAL, COMMISSIONING AND TESTING	

*To be completed only if commissioning, testing and monitoring is included in the design team's brief for scope of work.